UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

November 15, 2016

4SFD-SRSIB

MEMORANDUM

SUBJECT: Review of the "Screening Level Ecological Risk Evaluation TRV and Uptake Calculations" document for the International Paper site in Wiggins, Mississippi

FROM: Brett Thomas, Ph.D., Life Scientist
Scientific Services Section
Superfund Division, Superfund Resource and Scientific Integrity Branch

THRU: Glenn Adams, Chief, Scientific Services Section

TO: Doug McCurry, Senior Corrective Action Specialist, RCRA Division

Per your request, I evaluated the "Screening Level Ecological Risk Evaluation TRV and Uptake Calculations" document for the International Paper site in Wiggins, Mississippi. The purpose of the review was to determine if the TRVs and ecological risk parameters used in the dioxin ecological risk assessment for the sediments in Church House Branch appeared supportable, for those that differ from those preferred by EPA Region 4. The calculations and formulas used appeared to be robust, but there are EPA Region 4 preferred TRVs and fish lipid content values that differ from what is proposed by Ramboll. This is discussed further in the comments below.

Specific Comments

TRVs:

General comment: The papers used were viewed by Ramboll as more appropriate to use at the IP site "because mink is phylogenetically more similar to the raccoon than a rat." While I agree that the mink and raccoon are more similar than a rat and raccoon, the main point of the assessment was trying to be protective in general of mammals in the area. If it is desired to add a smaller mammal such as a rat (maybe a marsh rice rat or something like that) to fill in this aspect of the animal community in the creek area, we can do that, and perhaps we should. It was my mistake to

not be more inclusive of potential receptors in the Church House Branch watershed, and I apologize for that. I would rather not add a variety of receptors if it is not warranted, but I am certainly open to the idea.

For the Zwiernik article, the chemical tested is 2,3,7,8-TCDF – a furan, not a dioxin. The paper states that TCDF appears to be less toxic than TCDD, less so than is indicated by the WHO TEFs, so to base a TRV on a TCDF study and apply that to a site with TCDD is not really appropriate if protectiveness is a goal, given the conclusions in this paper. The LOAEL TRV listed as used in the International Paper ERA of "31 ng/kg BW-d" is actually in the paper as "a dietary concentration of 31 ng/kg ww". Therefore it appears to be a concentration of TCDF in the diet of the mink, not a daily dose to the mink. An approximate equivalent daily dose (using the captive FIR inferred from Moore et al. (2012)) would be:

$$31 \text{ ng TCDF/kg ww food-d} \times 0.115 \text{ kg ww food/kg BW-d} \approx 4 \text{ ng TCDF/kg BW-d}$$

For the Moore article, a NOAEL seems to be estimated as 8.4 ng TEQ/kg BW-d. This is, like in Zwiernik et al. 2009, using a dioxin/furan mix replicating that in the Tittabawassee River. I looked at the abstract (couldn't get the whole article) of an article (Heaton et al. 1995) that was cited in Moore (2012), and it stated that 3.6 ng TEQs/kg BW-d was their observed LOAEL to mink. Much of this was PCB driven, and according to Moore et al (2012) and Zwiernik et al. (2009) the TEQ toxicity – though it should not – does seem to vary with the constituents making up the TEQ burden (dioxins vs. furans vs. dioxin-like PCBs). It seems that showing this was part of the point of doing the Moore and Zwiernik work, and does point to some potential issues with the WHO TEFs. Nonetheless, it looks like a more extensive search into and analysis of literature would be warranted to determine more robust and supportable TRVs, especially given the roughly even mix (it appears) of dioxins vs furans in the Church House Branch sediments. Given the different mixes, it looks like LOAELs can vary between roughly 4 and 30 ng TEQ/kg BW-d for mink, just given the couple of studies looked at for this effort. And then for rodents of course there is the 10 ng TEQ/kg BW-d as cited in Sample et al..

Since there is not the time to do a more robust literature search and analysis for this effort, I would recommend/request that given the data available, the avian TRVs to use would be a NOAEL of 14 ng TEQ/kg BW-d and a LOAEL of 64 ng TEQ/kg BW-d (the LOAEL has been revised in the Region 4 preferred TRV list after an analysis of the Nosek et al. paper). For the mammal TRVs, I would recommend/request to use the rat data from Sample et al. which is a NOAEL of 1 ng TEQ/kg BW-d and a LOAEL of 10 ng TEQ/kg BW-d. Especially for the LOAEL this seems to land in the middle of the data distribution from the several studies looked at for this effort. If more discussion or analysis is warranted, then we can engage in that as necessary.

<u>Uptake Calculations – Lipid Contents</u>

Ramboll is proposing a 1.6% lipid content based on the data from 2 different studies. I propose a value of 5%, based on a presented "default value" for OECD studies (Schlechtriem et al. 2012), since site specific data were understandably not collected for Church House Branch. An excerpt cut and pasted from this document is provided below:

“Whole body lipid content default values for lipid normalization of BCF

Fish lipid content varies according to species, age, sex, season, and location, and it can range from around 0.5% to 20% *w*/*w* or more in the wild (e.g., [38]). BCF values for lipophilic compounds estimated on a wet weight basis (BCF_W) increase with increasing lipid contents. Normalization of BCF values to lipid content is one way to reduce variability when comparing measured BCF values, for instance, for different species or animals of different life stages. Lipid contents are commonly used to calculate BCF values on a percent lipid basis (BCF_L) but can be further used to calculate a normalized whole body BCF assuming a fixed whole body lipid content. A default value of 5% is most commonly used as this represents the average lipid content of the small fish used in OECD TG 305 [1] including the rainbow trout (*O. mykiss*), bluegill sunfish (*Lepomis macrochirus*), zebrafish (*Danio rerio*), fathead minnow (*Pimephales promelas*), and common carp (*Cyprinus carpio*) ([41, 42] cited in the REACH TGD (R.7.10.4) [43]).”

Therefore a value of 5% lipid content for fish is requested.

Table 5: I performed a calculation check for a few of the values for TCDD in this table, and the mechanics appear to be sound, but the values would change some given the use of the lipid content information above.

Table 8, TRVs: TRV comments were discussed above.

References

Heaton SN[1], Bursian SJ, Giesy JP, Tillitt DE, Render JA, Jones PD, Verbrugge DA, Kubiak TJ, Aulerich RJ. Dietary exposure of mink to carp from Saginaw Bay, Michigan. 1. Effects on reproduction and survival, and the potential risks to wild mink populations. Arch Environ Contam Toxicol. 1995 Apr 28(3):334-43

Schlechtriem, Christian, Annette Fliedner and Christoph Schäfers. 2012. Determination of lipid content in fish samples from bioaccumulation studies: contributions to the revision of guideline OECD 305. Environmental Sciences Europe: Bridging Science and Regulation at the Regional and European Level **24**:13 Found at: https://enveurope.springeropen.com/articles/10.1186/2190-4715-24-13

Thank you for the opportunity to review this document. Please let me know if you would like to discuss these comments. If so, please contact me at (404) 562-8751 or at thomas.brett@epa.gov.

Brett Thomas